REMARKS

Claims 1-10 are pending in this application. Claims 8 and 9 have been amended herein. Reconsideration in view of the following remarks is respectfully requested.

Claim Rejections - 35 USC § 112

Claims 1-6 were rejected under 35 U.S.C. § 112, first paragraph, as failing to comply with the written description requirement. Applicants respectfully traverse the rejection.

The Examiner contends that the limitation "the auxiliary electrode lacks any part that prevents a drift of electrons in the vicinity of the auxiliary electrode in a direction parallel to a front surface of the auxiliary electrode and a back surface of the auxiliary electrode," is not supported by the specification as originally filed. Applicants respectfully disagree.

The standard for determining compliance with the written description requirement is whether the initial disclosure of the application as a whole, i.e., including the specification, original claims and drawings, provides support for the claim language. Support for the limitation "the auxiliary electrode lacks any part that prevents a drift of electrons in the vicinity of the auxiliary electrode in a direction parallel to a front surface of the auxiliary electrode and a back surface of the auxiliary electrode," is provided, for example, in pages 7-8 of the specification. Support is also provided by the drawings, for example in Figures 1 and 2. Furthermore, to illustrate a case where the electrons may be prevented to drift as claimed, in pages 19-21 of the specification, exemplary embodiments are provided where the drift of electrons disappears due to collision with the first electrode (Figure 13) and where the drift of electrons disappears due to collision with the auxiliary electrode (Figure 14).

Consequently, Applicants respectfully submit that claims 1-6 are in full compliance with § 112, first paragraph. Therefore, withdrawal of the rejection of claims 1-6 under § 112, first paragraph is respectfully requested.

Claim Rejections - 35 USC § 102

Claim 10 was rejected under 35 U.S.C. § 102(e) over US Patent No. 6,232,236 to Shan et al. ("Shan"). Applicants respectfully traverse the rejection.

Claim 10 recites, *inter-alia*, "wherein electrons in the plasma drift from a front surface of said auxiliary electrode to a back surface thereof and from the back surface of said auxiliary electrode to the front surface thereof, wherein said first electrode is supplied with a

first radio frequency and said auxiliary electrode is supplied with a second radio frequency and wherein the first and the second radio frequencies are equal to each other and have different phases thereof." Among other reasons, by supplying the first electrode with a first radio frequency and the auxiliary electrode with a second radio frequency, the first and the second radio frequencies being equal to each other but with different phases, the electrons in the plasma are permitted to drift from a front surface of the auxiliary electrode to a back surface of the auxiliary electrode and vice versa.

Contrary to Examiner's contention, the apparatus of Shan is not capable of producing the plasma electron drift as claimed. Indeed, due to the "L-shape" structure of Shan's process kit 220, the electrons cannot drift from the top surface 222 to the bottom surface 224, much less drift from the bottom surface 224 to the top surface 222, because the extension 226 hinders the movement of electrons. Claim 10 requires that electrons in the plasma drift from a front surface of the auxiliary electrode to a back surface thereof and from the back surface of the auxiliary electrode to the front surface thereof. The apparatus of Shan clearly does not allow the electrons to drift as in the manner recited by claim 10. In fact, as indicated by the arrows shown in Figure 2 of Shan, the electrons drift from the secondary plasma 235 above the top surface 222 of process kit 224 to the primary plasma 230 above the wafer 116 (see col. 4, lines 50-59 in Shan). Moreover, Shan does not disclose, teach or suggest using a magnetic field generator configured to apply a static magnetic field to a surface of the substrate to which the plasma process is applied. In addition, the power source 302 in Shan delivers power to both the wafer support electrode 215 to drive the primary plasma and to the process kit 220 to drive the secondary plasma. The power source 302 provides two RF signals, with a single frequency, to the wafer support and the process kit. Shan is completely silent about the phase of the two RF signals provided to the wafer support and the process kit.

Since Shan does not describe or recite each and every feature as recited by claim 10, Shan cannot be said to anticipate claim 10. Therefore, Applicants respectfully submit that claim 10 is patentable and respectfully request that the rejection of claim 10 under § 102(e) be withdrawn.

Claim Rejections - 35 USC § 103

Claims 8 and 9 were rejected under 35 U.S.C. § 103(a) over Shan in view of US Patent No. 5,949,409 to Dornfest et al. ("Dornfest"). Applicants respectfully traverse the rejection.

As stated above, due to the "L-shape" structure of the process kit 220 of Shan, the electrons cannot drift from the top surface 222 to the bottom surface 224, much less drift from the bottom surface 224 to the top surface of the process kit 220. The presence of the extension 226 hinders the movement of electrons. Furthermore, as conceded in the Office Action, Shan does not disclose or suggest covering the auxiliary electrode with an insulating material.

Dornfest fails to overcome the deficiencies of Shan. Dornfest merely applies an insulating material to protect an electrode from the plasma atmosphere. In contrast, in claims 8 and 9, the front surface of the auxiliary electrode is covered by an insulating material. As a result, a difference in plasma density is created between the front surface of the auxiliary electrode (covered with the insulating material) and the back surface of the auxiliary electrode. This difference in plasma density is at least partially responsible for causing the electrons to drift between the front and the back surfaces of the auxiliary electrode.

Thus, neither Shan nor Dornfest, alone or in combination, disclose, teach or suggest, among other features, "an auxiliary electrode provided on an outer periphery of said first electrode to excite plasma in a vicinity of the auxiliary electrode, a front surface of said auxiliary electrode being covered by an insulating material such that a difference in plasma density is created between the front surface of the auxiliary electrode and a back surface of the auxiliary electrode, wherein electrons in the plasma drift from the front surface of said auxiliary electrode to the back surface thereof and from the back surface of said auxiliary electrode to the front surface thereof," as recited in claim 8, and "wherein electrons in the plasma drift from a front surface of said auxiliary electrode to a back surface thereof and from the back surface of said auxiliary electrode to the front surface thereof, wherein the front surface of said auxiliary electrode is covered by an insulating material and the back surface of said auxiliary electrode is not covered by said insulting material such that a difference in plasma density is created between the front surface of the auxiliary electrode and the back surface of the auxiliary electrode," as recited in claim 9.

Consequently, neither Shan nor Dornfest, alone or in combination, disclose, teach or suggest the subject matter recited by claims 8 and 9. Therefore, Applicants respectfully submit that claims 8 and 9 are patentable over the combination of Shan and Dornfest. Reconsideration and withdrawal of the rejections of claims 8 and 9 are respectfully requested.

Claim 7 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Shan in view of WO 98/39500 to Ohmi et al. ("Ohmi"). Applicants respectfully traverse this rejection.

Claim 7 recites, *inter-alia*, "applying a static magnetic field to a surface of the substrate to which the plasma process is applied; exciting plasma on at least a back surface of the auxiliary electrode; and causing electrons in the plasma to drift from a front surface of said auxiliary electrode to the back surface thereof and from the back surface of said auxiliary electrode to the front surface thereof." As discussed above with respect to claim 10, Applicants submit that Shan does not disclose, teach or suggest "causing electrons in the plasma to drift from a front surface of said auxiliary electrode to the back surface thereof and from the back surface of said auxiliary electrode to the front surface thereof." Furthermore, as conceded in the Office Action, Shan does not disclose or suggest a plasma processing method including applying a static magnetic field.

Ohmi does not cure the deficiencies noted with respect to Shan. Ohmi discloses a plasma etching device which has an auxiliary electrode and a magnetic device for applying a magnetic field to enable generation of uniform density plasma. The auxiliary electrode of Ohmi is attached to the electrode substrate holder (see Figure 1 in Ohmi). The back surface of the auxiliary electrode is in contact with the surface of the chuck. Hence, the electrons generated in the plasma and guided by the magnetic field cannot drift from the front surface of the auxiliary electrode to the back surface of the auxiliary electrode, because the back surface of the auxiliary electrode is not accessible to the flow of electrons. Moreover, there is no suggestion in either Shan or Ohmi to combine the teachings of Shan with the teachings of Ohmi and apply a static magnetic to the apparatus of Ohmi.

Furthermore, even if one were to modify the apparatus of Shan to include a static magnetic field, which Applicants do not concede is reasonable, the electrons in the plasma would not drift from a front surface of the process kit 220 of Shan to the back surface of the process kit 220 and from the back surface of the process kit 220 to the front surface thereof, because the extension 226 of the "L-shape" structure would hinder the movement of electrons.

Consequently, neither Shan nor Ohmi, alone or in combination, disclose, teach or suggest the subject matter recited in claim 7. Therefore, Applicants respectfully submit that claim 7 is patentable over Shan and Ohmi. Reconsideration and withdrawal of the rejections based upon these references are respectfully requested.

Claim 10 was rejected under 35 U.S.C. § 103(a) as being unpatentable over US Patent No. 4,950,956 to Asamaki et al. ("Asamaki") in view of US Patent No. 6,297,165 to Okumura et al. ("Okumura"). Applicants respectfully traverse this rejection.

Claim 10 recites, *inter-alia*, "wherein electrons in the plasma drift from a front surface of said auxiliary electrode to a back surface thereof and from the back surface of said auxiliary electrode to the front surface thereof, wherein said first electrode is supplied with a first radio frequency and said auxiliary electrode is supplied with a second radio frequency and wherein the first and the second radio frequencies are equal to each other and have different phases thereof."

As conceded in the Office Action, Asamaki does not disclose, teach or suggest an auxiliary electrode provided on an outer periphery of the first electrode to excite plasma by the auxiliary electrode so as to cause electrons in the plasma to drift from a front surface to a back surface of the auxiliary electrode and from the back surface to the front surface of the auxiliary electrode. Moreover, Asamaki does not disclose, teach or suggest that the first electrode is supplied with a first radio frequency, that the auxiliary electrode is supplied with a second radio frequency, or that the first and the second radio frequencies are equal to each other and have different phases. Furthermore, Asamaki does not disclose, teach or suggest a magnetic field generator configured to apply a static magnetic field to a surface of the substrate to which the plasma process is applied.

In response to Applicant's arguments, the Examiner states that the power source 40, which is discussed in Asamaki as being pulsed, is not used to power the magnetic field but, instead is used to power the electrodes. Applicants respectfully submit that in the response filed August 10, 2004, Applicants did not refer to the power source 40. Instead, Applicants referred to the power sources 35 and 36, where phases are shifted by 90°, to produce a rotating magnetic field. Thus, Applicants respectfully point out that the magnetic field of Asamaki is completely different from the static magnetic field of claim 7.

Okumura fails to overcome the deficiencies noted in Asamaki. Okumura merely teaches a ring-form voltage monitoring conductor 11 that is configured to monitor the self-bias potential generated in the substrate 8. The Okumura patent is directed to etching and cleaning methods in which an end of an etching process or cleaning process is determined based on the self-bias potential of the substrate, which is monitored by the voltage monitoring conductor 11 (see Figure 2 and col. 4, line 40 through col. 5, line 38 of Okumura). A high-frequency electric power is supplied to the substrate electrode 7 (which comprises the

pedestal 12 and the insulating member 13) and to the voltage monitoring conductor 11. When high-frequency electric power is supplied to a solid material in contact with a plasma, negative DC potentials are generated in the solid material. This DC potential is called self-biasing potential. Since the self-biasing potential on the substrate 8 cannot be measured directly, measuring the self-biasing potential on conductor 11 is used as a proxy. Thus, in order to replicate the self-biasing potential on the substrate 8, the conductor 11 is driven with high-frequency electric power in the same way as the substrate electrode 7. In addition to applying high-frequency electric power to the substrate electrode 7, a high DC voltage is also applied to the substrate electrode 7 to hold the substrate 8 on the chuck electrode 7.

Contrary to Examiner's contention, Okamura's capacitor 23 is not used to alter the phase but, instead, to break a direct current across the voltage monitoring conductor 11 and the pedestal 12. Without the capacitor 23, a large negative DC voltage would be generated in the pedestal 12, which would induce deterioration of the insulating member 13 (see, col. 5, lines 20-25 in Okumura).

Contrary to Examiner's contention, there is no suggestion in either Okumura or Asamaki to modify the apparatus of Asamaki to contain the ring-form voltage conductor of Okumura. Furthermore, Okamura's ring-form voltage monitoring conductor 11 is used for a completely different purpose than the auxiliary electrode of claim 1. In fact, Okumura teaches away from controlling the drift of electrons, as recited in claim 1, by specifically teaching that the electrode 11 is used to measure the self-biasing potential on substrate 8. It is improper to combine references where the references teach away from their combination, *In re Grasselli, 713 F.2d 731, 743, 218 USPQ 769, 779 (Fed. Cir. 1983).* See MPEP §2145XD2.

Even if one were to modify the apparatus of Asamaki to incorporate the structure of Okumura and apply a magnetic field to the structure of Okumura, which Applicants do not concede is reasonable, the electrons in the plasma would not drift as recited in claim 10 because of the presence of the high DC voltage in the substrate electrode 7. Indeed, the flow of electrons would be perturbed by the high DC potential field produced in the vicinity of the back surface of substrate electrode 7 and this would hinder, not encourage, the flow the electrons. Moreover, the magnetic field generated in Asamaki's apparatus is a rotating magnetic field. Thus, the magnetic field in the apparatus of Asamaki is completely different from the static magnetic field recited in claim 10 and would inherently produce a different effect on the electrons than the flow recited in claim 10. Even if the magnetic field source of

Asamaki could be configured to produce a static magnetic field, which Applicants do not concede is reasonable, the presence of the high DC potential produced in the vicinity of the back surface of the substrate electrode 7 would hinder the flow of electron as recited in claim 10.

Consequently, neither Asamaki nor Okumura, alone or in combination, may be said to disclose, teach or suggest the subject matter recited in claim 10. Therefore, Applicants respectfully submit that claim 10 is patentable. Reconsideration and withdrawal of the rejection based upon Asamaki and Okumura is respectfully requested.

Claims 8 and 9 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Asamaki in view of Okumura and further in view of Dornfest. Applicants respectfully traverse this rejection.

Asamaki does not disclose, teach or suggest an auxiliary electrode provided on an outer periphery of the first electrode to excite plasma by the auxiliary electrode so as to cause electrons in the plasma to drift from a front surface to a back surface of the auxiliary electrode and from the back surface to the front surface of the auxiliary electrode, as claimed in claims 8 and 9. Furthermore, Asamaki does not disclose, teach or suggest a front surface of the auxiliary electrode is covered by an insulating material such that a difference in plasma density is created between the front surface of the auxiliary electrode and a back surface of the auxiliary electrode, as claimed in claim 8. In addition, Asamaki does not disclose, teach or suggest the front surface of the auxiliary electrode is covered by an insulating material and the back surface of the auxiliary electrode is not covered by the insulting material such that a difference in plasma density is created between the front surface of the auxiliary electrode and the back surface of the auxiliary electrode, as claimed in claim 9. Also, Asamaki does not disclose, teach or suggest a magnetic field generator configured to apply a static magnetic field to a surface of the substrate to which the plasma process is applied. As stated above, the power sources 35 and 36 in Asamaki used to power the magnetic coils have phases that are shifted by 90° and produce a rotating magnetic field. Thus, the magnetic field of Asamaki is completely different from the static magnetic field of claims 8 and 9.

Okumura fails to overcome the above noted deficiencies in Asamaki. As discussed, the ring-form voltage monitoring conductor 11 of Okumura is used for a completely different purpose than the auxiliary electrode of claims 8 and 9. In fact, Okumura teaches away from controlling the drift of electrons as recited in claims 8 and 9 by specifically teaching that the electrode 11 is used to measure the self-biasing potential on substrate 8. Furthermore, the

capacitor 23 in the apparatus of Okumura is not used to alter the phase but to break a direct current across the voltage monitoring conductor 11 and the pedestal 12. Without the capacitor 23, a large negative DC voltage would be generated in the pedestal 12 which would induce deterioration in the insulating member 13 (see, col. 5, lines 20-25 in Okumura). Thus, neither Asamaki nor Okumura, alone or in combination, disclose, teach or suggest the subject matter recited in claims 8 and 9.

Dornfest fails to overcome the deficiencies noted above in Asamaki and Okumura. In addition, Dornfest merely uses an insulating material to protect an electrode from the plasma atmosphere. In contrast, in claim 2, the front surface of the auxiliary electrode is covered by an insulating material. As a result, a difference in plasma density is created between the front surface (covered with the insulating material) and the back surface. This difference in plasma density at least partially causes the electrons to drift between the front and the back surfaces of the auxiliary electrode. Therefore, Applicants respectfully submit that claims 8 and 9 are patentable over the combination of Asamaki, Okumura and Dornfest.

Reconsideration and withdrawal of the rejections based upon Asamaki, Okumura and Dornfest are respectfully requested.

Claim 7 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Asamaki, Okumura in view of WO 98/39500 to Ohmi et al. ("Ohmi"). Applicants respectfully traverse this rejection.

Claim 7 recites, *inter-alia*, "applying a static magnetic field to a surface of the substrate to which the plasma process is applied; exciting plasma on at least a back surface of the auxiliary electrode; and causing electrons in the plasma to drift from a front surface of said auxiliary electrode to the back surface thereof and from the back surface of said auxiliary electrode to the front surface thereof."

As discussed above, Applicants submit that the combination Asamaki and Okumura does not disclose, teach or suggest "causing electrons in the plasma to drift from a front surface of said auxiliary electrode to the back surface thereof and from the back surface of said auxiliary electrode to the front surface thereof." Furthermore, as conceded in the Office Action, neither Asamaki nor Okumura disclose or suggest a plasma processing method including applying a static magnetic field.

There is no suggestion in Asamaki, Okumura or Ohmi to modify the teachings of Asamaki taken in combination with Okumura to apply a static magnetic field. Furthermore, even if one were to modify the apparatus of Shan to include a static magnetic field, which

Applicants do not concede is reasonable, the electrons in the plasma would not drift from the front surface of the process kit 220 to the back surface and from the back surface to the front surface, because the extension 226 of the "L-shape" structure would hinder the movement of electrons.

Consequently, none of Asamaki, Okumura and Ohmi, alone or in combination, disclose, teach or suggest the subject matter recited in claim 7. Therefore, Applicants respectfully submit that claim 7 is patentable over the combination of Asamaki, Okumura and Ohmi. Reconsideration and withdrawal of the rejections based upon these references are respectfully requested.

CONCLUSION

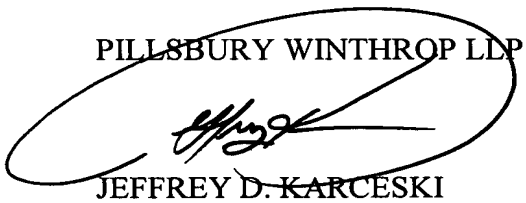
In view of the foregoing, the claims are now in form for allowance, and such action is hereby solicited. If any point remains in issue which the Examiner feels may be best resolved through a personal or telephone interview, he is kindly requested to contact the undersigned at the telephone number listed below.

All objections and rejections having been addressed, it is respectfully submitted that the present application is in a condition for allowance and a Notice to that effect is earnestly solicited.

Please charge any fees associated with the submission of this paper to Deposit Account Number 033975. The Commissioner for Patents is also authorized to credit any over payments to the above-referenced Deposit Account.

Respectfully submitted,

PILLSBURY WINTHROP LLP



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